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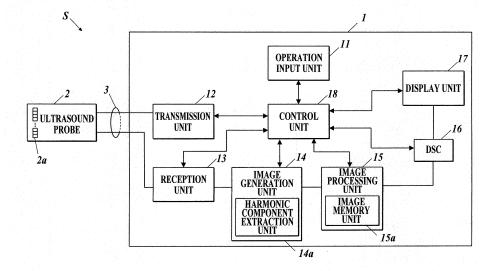
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(54) Ultrasound diagnostic tissue harmonic imaging apparatus with improved drive pulses

(57) Disclosed is an ultrasound diagnostic imaging apparatus including an ultrasound probe which outputs transmission ultrasound toward a subject due to a pulse signal being input and which outputs a received signal by receiving reflected ultrasound from the subject and a transmission unit which makes the ultrasound probe generate the transmission ultrasound by outputting a pulse signal whose drive waveform is formed of rectangular waves. The transmission unit outputs pulse signals

whose drive waveforms are asymmetric to each other on a same scanning line for a plurality of times with a time interval therebetween. The ultrasound diagnostic imaging apparatus further includes an image generation unit which combines received signals each of which obtained from the reflected ultrasound of the transmission ultrasound generated by each output of pulse signal and generates ultrasound image data on a basis of a composite received signal.

FIG.2



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EUROPEAN SEARCH REPORT

Application Number EP 14 16 0189

of relevant pass EP 1 726 261 A1 (HI [JP]) 29 November 2 * abstract *; figur * paragraphs [[0001 * paragraphs [[0032 US 2004/230121 A1 (18 November 2004 (2 * paragraphs [0003] [0056]; figures 1,2 MILLS D M ET AL: " imaging with capaci ultrasound transduct arrays", 2003 IEEE ULTRASONI PROCEEDINGS. HONOLU 2003; [IEEE ULTRASO	TACHI MEDICAL CORP 006 (2006-11-29) es 3,15-21 *]] - [[0018]] *]] - [[0084]] * HANSEN RUNE [NO] ET AL) 004-11-18) , [0010], [0042] - * Treal-time in- vivo tfve micromachined er (cMUT) linear CS SYMPOSIUM	Relevant to claim 1-7 1-7	CLASSIFICATION OF THE APPLICATION (IPC) INV. G01S7/52 G01S15/89 B06B1/02
[JP]) 29 November 2 * abstract *; figur * paragraphs [[0001 * paragraphs [[0032 US 2004/230121 A1 (18 November 2004 (2 * paragraphs [0003] [0056]; figures 1,2 MILLS D M ET AL: " imaging with capaciultrasound transducarrays", 2003 IEEE ULTRASONI PROCEEDINGS. HONOLU 2003; [IEEE ULTRASO	0006 (2006-11-29) es 3,15-21 *]] - [[0018]] *]] - [[0084]] * HANSEN RUNE [NO] ET AL) 004-11-18) , [0010], [0042] - * Treal-time in- vivo tfve micromachined er (cMUT) linear CS SYMPOSIUM	1-7	G01S7/52 G01S15/89
18 November 2004 (2 * paragraphs [0003] [0056]; figures 1,2 MILLS D M ET AL: "imaging with capaciultrasound transducarrays", 2003 IEEE ULTRASONI PROCEEDINGS. HONOLU 2003; [IEEE ULTRASO	004-11-18) , [0010], [0042] - * Treal-time in- vivo tfve micromachined er (cMUT) linear CS SYMPOSIUM		
imaging with capaci ultrasound transduc arrays", 2003 IEEE ULTRASONI PROCEEDINGS. HONOLU 2003; [IEEE ULTRASO	tfve micromachined er (cMUT) linear CS SYMPOSIUM	7	
vol. 1, 5 October 2 568-571, XP01070281 DOI: 10.1109/ULTSYM	ORK, NY: IEEE, US, 1903 (2003–10–05), pages 3, 1.2003.1293467		TECHNICAL FIELDS SEARCHED (IPC) G01S B06B
[NO] ET AL) 16 Dece	mber 2004 (2004-12-16)	2-7	
The present search report has	peen drawn up for all claims	-	
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		721	neboni, Thomas
TEGORY OF CITED DOCUMENTS cularly relevant if taken alone cularly relevant if combined with anot ment of the same category tological background	T : theory or principl E : earlier patent doc after the filing dat D : document cited in L : document cited fo	e underlying the cument, but publice in the application or other reasons	invention ished on, or
	* Section III. * US 2004/254459 A1 ([N0] ET AL) 16 Dece * the whole documen The present search report has I Place of search Munich TEGORY OF CITED DOCUMENTS sularly relevant if taken alone unterly relevant if combined with anoth ment of the same category	The present search report has been drawn up for all claims Place of search Munich TEGORY OF CITED DOCUMENTS quality relevant if taken alone sularly relevant if to the same category cological background written disclosure Minich Munich Munich Munich Tegory OF CITED DOCUMENTS Tegory OF CITED DOCUMENTS To theory or principle Examiler patent document of the same category Cological background Written disclosure Strength (NRISTOFFERSEN KJELL (2004-12-16) * Date of completion of the search 16 October 2014 Tegory OF CITED DOCUMENTS To theory or principle Examiler patent document of the same category Cological background Written disclosure Strength (2004-12-16) * The present search report has been drawn up for all claims Date of completion of the search 16 October 2014 To theory or principle Examiler patent document of the search 17 theory or principle Examiler patent document of the search 18 carrier patent document of the search 20 carrier patent document of the search 20 carrier patent document of the search 20 carrier patent document of the search 21 carrier patent document of the search 22 carrier patent document of the search 23 carrier patent document of the search 24 carrier patent document of the search 25 carrier patent document of the search 26 carrier patent document of the search 27 carrier patent document of the search 28 carrier patent document of the search 28 carrier patent document of the search 28 carrier patent document of the search 27 carrier patent document of the search 28 carrier patent document of the search 28 carrier patent document of the search 29 carrier patent document of the search 20 carrier patent document of the search	* Section III. * US 2004/254459 A1 (KRISTOFFERSEN KJELL [N0] ET AL) 16 December 2004 (2004-12-16) * the whole document * The present search report has been drawn up for all claims Place of search Munich TEGORY OF CITED DOCUMENTS Aularly relevant if taken alone sularly relevant if tombined with another ment of the same category cological background written disclosure TEGORY OF CITED DOCUMENTS Aularly relevant if tombined with another ment of the same category cological background written disclosure TEGORY OF CITED DOCUMENTS Aularly relevant if tombined with another ment of the same category cological background written disclosure TEGORY OF CITED DOCUMENTS TEGORY OF CITED DOCUMENTS Aularly relevant if tombined with another ment of the same category Cological background written disclosure TEGORY OF CITED DOCUMENTS TEGORY OF CITED DOCUMENTS TEGORY OF CITED DOCUMENTS TEGORY OF CITED DOCUMENTS Aularly relevant if town alone will another ment of the same category Cological background written disclosure TEGORY OF CITED DOCUMENTS TEGORY OF CITED DOCUMENTS TEGORY OF CITED DOCUMENTS TEMPORATION TO THE SEARCH AND TH

ANNEX TO THE EUROPEAN SEARCH REPORT ON EUROPEAN PATENT APPLICATION NO.

EP 14 16 0189

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This annex lists the patent family members relating to the patent documents cited in the above-mentioned European search report. The members are as contained in the European Patent Office EDP file on The European Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

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EP 1726261 A1 29-11-2006 CN 1909837 A 07-02- EP 1726261 A1 29-11- JP 4415011 B2 17-02- US 2008228076 A1 18-09- WO 2005087109 A1 22-09- US 2004230121 A1 18-11-2004 NONE
UC 0004054450 41 16 10 0004 DE 100004007005 41 20 10
US 2004254459 A1 16-12-2004 DE 102004027025 A1 30-12- JP 4942290 B2 30-05- JP 2005000663 A 06-01- US 2004254459 A1 16-12-

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 $\stackrel{\circ}{\mathbb{H}}$ For more details about this annex : see Official Journal of the European Patent Office, No. 12/82